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Humanitarian Engineering in Spain

Ingenieros sin Fronteras

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Ingenieros sin fronteras (ISF), the translation to Spanish of “Engineers Without Borders,” is the most important Spanish organization related to humanitarian engineering, as well as one of the most important NGOs in Spain overall. ISF started in 1992 and the organization is structured as a federation where regional independent associations are represented by an assembly and a committee. The Association aspires to help integrate cultural, political, social, economical, and environmental contexts into technology, and to use technology for the service of human development. ISF works towards a just and solidarity-based society worldwide. Activities include: development programs, education, social awareness efforts, networking, and institutional relations. The Association is comprised of members, volunteers, and staff. Financial support comes primarily from the Spanish central and regional governments and from city councils, as well as from international organizations, universities, and private donations.

History

In 1987, Spain became involved in the European Erasmus student exchange program. The Erasmus program has been praised as one of the most successful educational experiences in Europe. The program supports international contact among students as a pathway to shared experiences among its participants.

Spain’s first Erasmus exchanges were between Spanish engineering schools and other European universities. At the time, France was a popular destination for Spanish students because French was popular as a second language in Spain, and because of the historical cultural references and similarities between the two countries and cultures.

Humanitarian engineering in Spain grew out of the experiences of Erasmus participants. Spanish exchange students in France discovered the French association *Ingénieurs sans*

Frontières. During their time on the exchange program they were involved in projects related to international cooperation, became enthusiastic about the idea, and decided to start a similar initiative at their own universities [1], [2].

The first predecessor groups to Ingenieros sin Fronteras (ISF) began in Madrid, Zaragoza, and Asturias in 1990; Barcelona created its own association in 1992. During the 1990s, other groups were initiated simultaneously in several other communities. These small associations became aware of each other and began travel to Southern hemisphere countries. Over the course of these first trips the students developed

opment and humanitarian assistance according to Organization for Economic Cooperation and Development (OECD) criteria.) This movement was supported by the early ISF associations, among other entities, and the 0.7 campaign’s success increased financial support to cooperative associations in general [3], [4].

Around 1992–1994, the predecessor associations gathered gradually and formally into a federal organization known as Ingenieros sin Fronteras. Since 1997, ISF has belonged to the Spanish Coordinating Assembly of NGOs, and since 2001 the organization has been part of the Coordinating Assembly’s Directive Committee.

Our projects aim to be economically, environmentally, socially, and institutionally sustainable.

understanding of host country environments, and identified needs as well as technical assistance they could contribute. Afterwards, these initial experiences would become integral to development projects.

The various regional organizations in Spain also organized conferences and presentations at several schools and university campuses. In the beginning, some volunteers also were students who had declared conscientious objection to Spain’s compulsory military service, and who were able to use ISF as a substitute social program. These activities and membership growth allowed the creation of the first contracted Staff positions for the organization.

Another important political movement that contributed to the cohesion and growth of ISF predecessor associations in Spain was early members’ participation in the 0.7 movement. Started around 1993 in Spain, this movement was a campaign asking the government to offer 0.7% of gross national product to cooperation actions. (Cooperation actions are activities aimed at promoting devel-

Organization and Structure

Today ISF in Spain is a federation composed of independent regional entities that, at the national level, channel their proposals through common interlocutors elected by an assembly. The aim is to work in a network, with a decentralized framework, and to create synergies among the regional entities [1], [2]. The political structure of Spain, divided into regions with independent local governments, supports this federal concept. The financial structure of ISF in Spain is also related to this dual regional/central principle.

Tasks of the federation include: representing ISF to national and international organizations; facilitating communication and documentation exchange among the associations; monitoring the new associations and their integration in the federation; and coordinating common projects.

The Federation is structured into several organizations:

- The Federal Meeting: includes all associated members; monitors the activities developed

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by ISF, and elects representatives of the associations and the federal committee.

- The Federal Committee: an operation group, representative of the organization, manages the budget, plans the meetings and acts commissioned by the federal assembly.

- The Federal Assembly: the most important decision-making arm of the ISF, comprised of the Federal Committee and representatives of every association.

The associations making up the federal union are very heterogeneous in terms of activity, number of as-

sociates, and seniority. The most important regional associations are (in alphabetical order): Andalucía, Aragón, Asturias, Cantabria, Castilla-Leon, Cataluña, Galicia, Islas Baleares, Murcia, Navarra, País Vasco, and Valencia. In addition, there is an entity called Asociación para el Desarrollo (Association for Development), which includes several regions. Some of these associations include smaller groups from several cities.

Motivation and Principles

ISF defines itself as a Non-Governmental Association for Development.

ISF FAQ

Answered by Eva Reguera

President of ISF

What is the ISF approach to Humanitarian Engineering?

We understand Humanitarian Engineering through Cooperation for Development, and more accurately, we base our work on Universal Access to Basic Services.

We demand the universal human right to gain access to basic services with quality and proper use ensured.

Which underlying values support

ISF and its activities?

The values we integrate in our work are based on Technology for Human Development, understanding technology as the integration of infrastructures, people, and knowledge, and also considering culture, and appropriate and local technologies.

We focus on people, being respectful of their rights, and on making the whole community leaders of their own development with no distinction related to gender, or ethnic or physical capability.

Finally, our projects aim to be economically, environmentally, socially, and institutionally sustainable.

What is the technology concept promoted by ISF?

Our concept is our first value: Technology for Human Development. This technology covers human rights and equity of basic services. It also ensures production and social participation possibilities and facilitates sustainability and autonomy.

This means that we know that it is technically possible to cover food, health, life, and education needs and that engineering is an essential instrument for universal access to basic services. Potable water, health care, energy and communications are key factors in the fight against poverty.

Which guiding principles are followed to decide the participation in a specific project?

ISF participates in a project when it has a direct effect on the beneficiaries. They demand the project and participate on it from the identification of the need to the implementation of the solution. Furthermore, the beneficiaries must ensure their responsibility and commitment in the continuation of the project once ISF ends its work.

What is the policy of ISF regarding participation in national entities such as the Spanish Coordinating Assembly of NGO, Committee for Cooperation and Development, and the Commission for Development and Monitoring?

Being a Federation, we are aware of the results that our network produces in Cooperation for Development. Union of diversity creates strength, and the specialization areas chosen by the different NGOs must be used to produce more efficacy in our work.

On the other hand, we also think it is necessary for a common voice to transmit to developing countries necessities and the claim of their rights to our government and civil society. Those are our main reasons for being part of these entities.

The organization is dedicated to cooperation for development that aspires to build a just and solidarity-based worldwide society, and to put technology to the service of human development [5]. ISF's approach to humanitarian engineering is related to improving the well-being of underserved populations.

ISF's basic statements include:

- **Motivations:** Respecting different personal motivations linked by the disposition to serve less advantaged countries, communities, and per-

sons, according to the principles of international solidarity by using their education and professional experience.

- **Bonds:** Respecting any type of religious, political, or ideological belief but not being influenced by any of these or by the interests of any professional collective. ISF declares itself as non-party and secular, but not apolitical because its members actively support social justice and consider policy a way of transforming social structures.

- **World Vision:** ISF members consider themselves international, accepting principles of fraternity and cooperation among the people of the world. They respect human dignity and the environment, and do not collaborate with warlike activities or with activities that attack human rights.

- **Cooperation:** ISF cooperates with all people and with nations that are experiencing poverty or marginality because of unjust wealth distribution. ISF members also cooperate with

How does ISF envision collaboration with universities?

Ingeniería Sin Fronteras has been present in Spanish universities since we were born. Our aim has always been to make the participation of students, teachers, and workers in Cooperation for Development easier. It is our duty to create a critical space for debate, education, and investigation in this area.

We also try to supply a space for Technology, Society, and Development in technical education. We think this space is empty today. Engineers must have a social point of view, a responsibility to the rest of society.

Why does ISF not belong to the international EWB association?

Ingeniería Sin Fronteras is a Federation, meaning that it is composed by 14 different ONG, all of them sharing the name, but with different surnames depending on the region where they were created. At the beginning each association worked on its own, but after some time, when we realized that we shared the same ideology and underlying values, the Federation was born.

This example can be extrapolated to the international association. We believe that sharing a name is not enough motivation for being part of an association. The way that our Federation was born has provided us a valuable experience in this field.

Our mission, vision, and values are different from the ones the EWB-International has. We not only focus on projects in developing countries, we also work in Edu-

cation for Development, Sensitizing, and Political Incidence in developed countries.

What are the distinctive features of the associations that compose the Federal ISF?

The Spanish Federation of ISF is comprised of 14 associations; each of these has its own board of directors and bylaws. This makes each association responsible of their own management, resulting in some differences among them.

Differences are present, for example, in their social bases. The number of volunteers changes as much as their profiles. We can find associations with only eight volunteers, most of them being university teachers, and great activity, while others are larger and include pensioners, students, and professionals and show different features.

Another differentiation is related to the work that each ISF focuses on. While some associations are more active in projects in developing countries, others work only in Education for Development, Sensitizing, and Political Incidence in developed countries.

Being located in a Spanish region with its own government brings decentralization to each ISF in its relationship with the Administration, Universities, and civil society, improving their local contacts. Each ISF receives funds from its local government and universities. The associations act in coordination when negotiating with Spanish Central Administration.

ISF members favor local techniques that avoid dependence on external sources.

organizations that share their objectives in all fields where the members of the organization are able to contribute.

- **Participation:** Cooperation must be requested, led and accepted by the receivers of the actions: people and local organizations that act as counterparts. One of the operating principles of the association is working with an NGO that acts as counterpart in the area where the action is planned. This system is designed to collaborate in the diagnosis of the local needs and the best way to resolve them. These NGOs are also involved in educational activities in Spain. Beyond the specific projects the relation of ISF with the counterparts is understood as a common compromise of political and social transformation. The leadership of these collectives is always respected by ISF.
- **Integral Conception:** ISF's projects are not rushed. There is an initial study of the complex environments surrounding the projects, and ISF uses multidisciplinary research as a way to achieve integral conceptions that will also remain active once cooperative action finishes.
- **Technology:** ISF questions dominant conceptions of technology. The organization understands technology to be linked to the cultural, social, economic, political and environmental context in which it is developed. ISF members favor local techniques that avoid dependence on external sources.
- **Education for Development:** ISF studies the reality in which actions take place to help in the dissemination of its features, and to help evaluate the impact of support initiatives designed to improve these realities. Also ISF participates in education in academic and professional environments aspiring to the creation of a critical awareness able to generate alternatives to the current development model.
- **Associationism:** ISF members

do not seek personal prominence or economic remuneration. The association defines itself as democratic, where basic members participate actively in decisions.

Financial Support and Destination of Funds

Activities and numbers of participants in ISF associations have increased greatly in the last few years; in 2008 ISF included 2756 associates, 928 volunteers and 84 contracted staff [1], [2].

Most of ISF resources are from public sources (about 81% in 2008), either from the Spanish and regional governments, universities, international entities, or city councils that contribute through local representatives of the association. Private funds (20%, 2008) are provided by donations from the associates or from other contributors. A diagram of these resources is shown in Fig. 1. The ratio of public to private financing has increased in 2008. The total income in 2008 was 7 711 362 Euros.

Most of the funds are used for development projects (79% in 2008). Fig. 2 shows the distribution of the resources applied for 2008 [2].

Activities

Consistent with economic data presented previously, ISF's main activity is working in development projects in several geographical areas. The aim is to provide access to basic services and to increase the quality of life of disadvantaged social groups. The programs are based in sustainable development, from technological, economical, and social points of view. The actions supported by ISF are designed to become examples in order to promote other actions by demonstrating the possibilities of improvement provided by technology when correctly applied to the improvement of human quality of life.

Selection of the projects is based on previous experience and on ISF

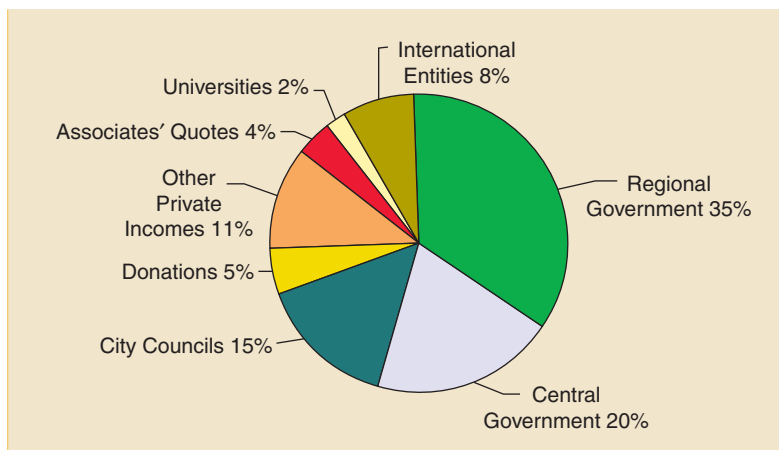


Fig. 1. Origin of financial support for ISF. Data 2008. Total income: 7 711 362 euros [2].

partner's knowledge and understanding of the affected area. Discussions with local organizations strongly influence selection decisions.

The actions are inscribed in five basic areas [2]:

- Equipment, infrastructure, and service networks: aiming to improve the quality of life of affected populations through the provision of these goods. Examples: Water, energy, sewage and communications infrastructures for rural communities in Cabo Delgado (Mozambique); Barrios Program: improving quality of life in Yaoundé neighborhoods (Camerun) [2], [6].
- Water and sanitation: promotes universal access to these basic resources. Examples: improvement in water and residual solids management in the Arabic Saharaui Republic; Project of Safety of Water for drinking water supply in rural municipalities of La Libertad (El Salvador) [2], [7].
- Farming development, Management of the territory, Microenterprises: promotion of the sustainable economic development and continuous income generation in rural areas through environmentally friendly practices. Examples: several projects in Nicaragua including Productive reactivation of municipality of La Concordia (Nicaragua) by installation of drop watering and assessment of the cultivation and commercialization of vegetables; Sobal program in Argentina improving primary production of indigenous communities.
- Information and communication technologies: improving human development by enhancing availability of these basic services. Examples: Wilay project: use of ICT in order to support the democratic

ISF's work implies the use of engineering as a tool to provide access to human rights and services.

governability of rural areas in Peru; AliboriNET Project in Benin: providing ICT support to development entities for equipment for of an Internet access point and formation of the staff in charge of operation and maintenance.

- Energy: providing basic energy services. Examples: Final stage of implantation of photovoltaic solar energy in

the Community Center for Integral Education Futuro Vivo in Dominican Republica; Energy supply to Andean municipalities in Peru, Ecuador, and Bolivia.

The geographical areas of action include: Central America (43%), Africa (35%), and South America (22%) [2]. A comparative representation of the actions is presented in Fig. 3.

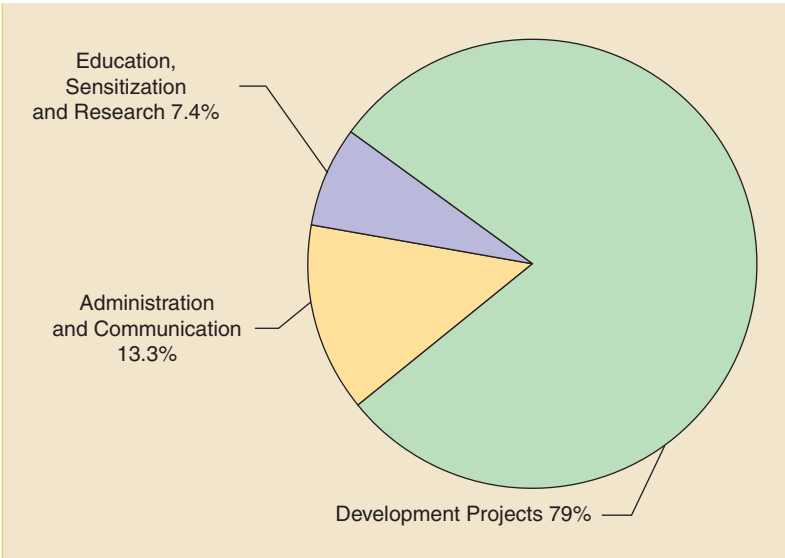


Fig. 2. Distribution of expenses. Data 2008 [2].

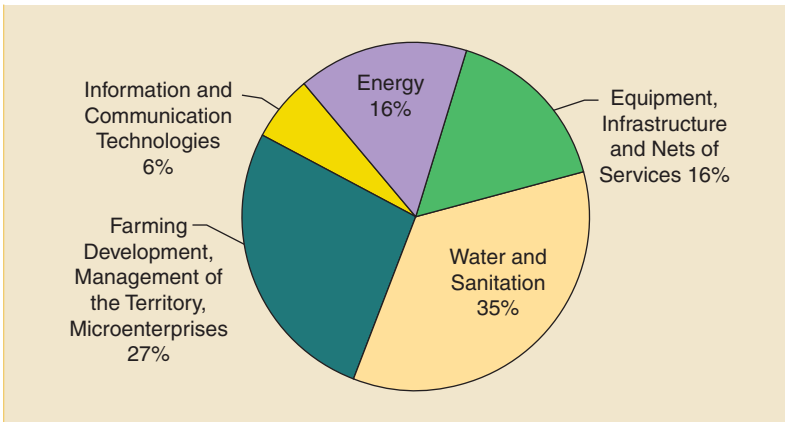


Fig. 3. Sectoral distribution of the projects. Data 2008 [2].

ISF's structure allows extending the organization's activities in Spain to the public sphere.

Education

ISF promotes activities aimed at education for development. The areas of action include:

- Higher Education: Official studies offered in Universities, especially in science and technology programs [9], [10]. In 2006, the project "Supporting Proposals for Human and Sustainable Development at UPC 2000–2005" was awarded the Prize for Educative Quality by Technical University of Catalonia (UPC). Several free elective courses are included in official programs proposed in relevant Spanish universities. In collaboration with the Open University of Catalonia (UOC online education), ISF has offered a Master's in Engineering degree applied to human development [10].
- Courses, conferences, traineeships, and offers for participation: most of these activities are also offered in collaboration with Universities, but they are not part of the official programs of the University [11].
- Courses, materials, and resources for primary and secondary schools [12]–[14].
- Publications: ISF organizations promote publications related to their expertise area, in the form of books, digital content, audiovisuals, an informative bulletin every three months, and a monthly digital bulletin.
- Research, development, and innovation: Working in collaboration with Universities, ISF supports technology di-

rected at human development and critically observes engineering disciplines. ISF organizes concourses for Final theses and Ph.D. theses related to technology for human development. ISF also participates in several Congresses presenting communications. Individually, the regional associations are involved in several research projects according to their own interests and possibilities.

Sensitization

Some of the activities organized by ISF are intended to increase public sensitivity to issues in ISF's interest areas. These actions directly or indirectly increase or coordinate proposals linked to international cooperation and development. The ISF bases eligibility criteria on their understanding of "cooperation." The scope of the project and public relevance are also taken into account.

Some recent actions include participation in World Water Day as part of ISF's Water Campaign, and organization of the *Conference on Rights to Water* held in Madrid, and the *Conference on Governability and Management of Water* in Lleida. ISF has also produced documentaries such as: "Water, a right and not merchandise" (available in several languages) [15], and "Niños de agua" [16].

ISF activities also include art contests and exhibitions. In 2008 ISF organized the II Concurso de Expresión Artística (II Contest of Artistic Expression) and the Exposición Internacional Agua y Desarrollo Sostenible (International Exhibition on Water and Sustainable Development).

Networking and Institutional Relations

As part of the Spanish Coordinating Assembly of NGOs, ISF participates in the governmental assessing Committee for Cooperation and Development. Additionally ISF belongs to the Commission for Development and Monitoring, which monitors Spanish cooperation activities [17]. ISF also participates in the Corporate Social Responsibility Observatory, which monitors business activities.

ISF Influence

The start of humanitarian engineering in Spain was after other European countries and was a result of the European Community policy through the Erasmus Program. Since then, there has been a rapid increase in the number of activities. The importance of ISF has grown in only a few years and its influence is continuously increasing.

The conception of ISF's work implies the use of engineering as a tool to provide access to human rights and services. In this sense, ISF activities are not only framed by development projects but also pursue a social transformation in the local environment and even in Spain. This is a distinctive emphasis compared to other similar associations. ISF members aspire to a higher goal than development. Their activities tend to include a broader scope than national scale implications. ISF's organizational structure is based on that approach. International projects are carried out by local counterparts, while most of the components of ISF work in Spain. Contracted staff provide administrative support, while volunteers develop most of the activities generated in their own environment. This configuration improves the efficiency of the application of the funds applied to development projects and also makes it possible to achieve a high level of activity in education and a high degree of sensitization, all at reasonable

cost. Delegation of projects to local counterparts is designed to avoid paternalist attitudes towards local partners in the project.

ISF's structure allows extending the organization's activities in Spain to the public sphere, including allowing for governmental participation. Concern for increasing social awareness is indicated by ISF's sensitization and educational activities. Their educational impact can be seen in the resources that they provide at every educational level. Strong links to universities are exemplified by the fact that many regional ISFs are located near a university. This academic, nonprofessional character may be related to the integral, social approach underlying ISF's motivations, versus an economic point of view. Confronted with criticisms that an association composed mainly of nonprofessionals is inefficient, the ISF points to the advantages of working with experienced counterparts based in countries where projects are developed.

ISF's influence in public policy has become more intense with their participation in national policy issues through the Consejo de Cooperación al Desarrollo (Committee for Cooperation and Development). This committee is defined by law as the counselor and participation organism for Spain's cooperation policy. The political implications of ISF are also expressed by denouncing irregular situations and actions beyond merely technological scenarios. ISF's motivations and principles imply public participation beyond the application of technology, and that has probably influenced the organization's political strategy.

ISF's future plans include: mapping organizational processes, in-

ternal reflection and evaluation; increasing specialized education through Master's and postgraduate programs, introductory courses, and education of educators; new publications and participation in several conferences; and public actions. Today Spain is immersed in a process of change in their higher education programs in order to adapt to the requirements described in the Bologna Declaration. The new educative structures were developed with the goal of improving students' and professors' mobility, and these new structures will allow the introduction of new Master's programs. In this new scenario, initiatives related to humanitarian engineering like those by ISF may find ready acceptance within the academic community.

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References

- [1] ESF, "Memòria d'activitats 2007," Associació Catalana d'Enginyeria sense fronteres, Barcelona, Spain, 2008.
- [2] ISF, "Memoria de actividades 2008," Ingeniería sin fronteras, Madrid, Spain, 2009.
- [3] F. García, "El movimiento del 0,7% en Castilla la Mancha: De la cooperación a la justicia," *Añil*, vol. 16, 1998; http://biblioteca2.uclm.es/biblioteca/CECLM/ARTREVISTAS/a%C3%B1il/A%C3%91IL16_GarciaMovimiento.pdf.
- [4] Ch. Marcuello, "El movimiento 0,7%: Un pulso colectivo;" http://www.recolecta.net/buscador/single_page.jsp?id=oai:dialnet.unirioja.es:ART0000202329
- [5] "La Federación española de ISF," in *Voluntariado, cooperación y tecnología para el desarrollo humano*, online course, Universidad Oberta de Catalunya, Spain; [http://www.isf.es/menu_actividad/act_cursos.php?submenu=405&\\$sesion_idioma=1&\\$menu=&identifica=educacion&nombrexml=109&listCurso=1627](http://www.isf.es/menu_actividad/act_cursos.php?submenu=405&$sesion_idioma=1&$menu=&identifica=educacion&nombrexml=109&listCurso=1627).

[http://www.isf.es/menu_actividad/act_cursos.php?submenu=405&\\$sesion_idioma=1&\\$menu=&identifica=educacion&nombrexml=109&listCurso=1627](http://www.isf.es/menu_actividad/act_cursos.php?submenu=405&$sesion_idioma=1&$menu=&identifica=educacion&nombrexml=109&listCurso=1627).

- [6] S. Oliete-Josa, S. Alvarez, and E. Ngnikam, "Las mejoras de infraestructura y servicios, herramienta de integración de los barrios precarios de Yaoundé," in *Cuadernos Internacionales de Tecnología para el Desarrollo Humano*, vol. 3, 2004; <http://www.cuadernos.tpdh.org>.
- [7] W. Gonzalez, "Planificación, reconstrucción e incidencia desde la sociedad civil en El Salvador," in *Tecnología para el Desarrollo Humano. Agua e Infraestructura*, A. Perez-Foguet, M. Carrillo, and F. Magrinyà, Eds. Barcelona, Spain: ISF, 2003.
- [8] A. Pérez-Foguet, S. Oliete-Josa, A. Saz-Carranza, "Development education and engineering: A framework for incorporating reality of developing countries into engineering studies," *Int. J. Sustainability in Higher Education*, vol. 6, no. 3, 2005.
- [9] A. Pérez-Foguet, M. Morales, and A. Saz, "Introducción a la cooperación al desarrollo para las ingenierías. Una propuesta para el estudio," *Associació Catalana d'Enginyeria sense fronteres*, Barcelona, Spain, 2005; http://www.uoc.edu/masters/esp/web/cooperacion_humanitaria_paz_y_sostenibilidad/ingenieria_aplicada_a_la_cooperacion/master/master_en_ingenieria_aplicada_a_la_cooperacion_para_el_desarrollo/.
- [10] "Voluntariado, cooperación y tecnología para el desarrollo humano," Universidad Oberta de Catalunya, online course; [http://www.isf.es/menu_actividad/act_cursos.php?submenu=405&\\$sesion_idioma=1&\\$menu=&identifica=educacion&nombrexml=109&listCurso=1627](http://www.isf.es/menu_actividad/act_cursos.php?submenu=405&$sesion_idioma=1&$menu=&identifica=educacion&nombrexml=109&listCurso=1627).
- [11] C. Sánchez, "Recursos educativos," in *Cuadernos Internacionales de Tecnología para el Desarrollo Humano*, vol. 3, ISF, 2004; <http://www.cuadernos.tpdh.org>.
- [12] M. Morales and S. Pérez, "Integració de la tecnologia per al desenvolupament humà en l'ensenyament secundari obligatori," *Associació Catalana d'Enginyeria sense fronteres*, Barcelona, Spain, 2007.
- [13] Enginyeria sense Fronteres, Grup de sobirania alimentària, "La Colla Pesigolla," *Associació Catalana d'Enginyeria sense fronteres*, Barcelona, Spain, 2008.
- [14] Associació Catalana d'Enginyeria sense fronteres, "Aigua un dret i no una mercaderia," Barcelona, Spain: Àgora Nord-Sud, 2007 (DVD).
- [15] ISF, "Niños de agua," Real Decreto 2217/2004, de 26 de noviembre, sobre competencias, funciones, composición y organización del Consejo de Cooperación al Desarrollo (DVD); <http://www.lexureditorial.com/boe/0411/20119.htm>.